

## Utility of susceptibility weighted imaging for the detection of arteriovenous shunting in vascular malformations of the brain

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#### Purpose:

To evaluate the utility of susceptibility weighted imaging (SWI) for the detection of arteriovenous shunting (AVS) in brain vascular malformations (BVM).

**Materials and methods:** Using radiology records search, we retrospectively identified 47 patients at our institution who had undergone both conventional catheter digital subtraction angiography (DSA) of the brain for a known or suspected BVM and also a brain MRI including SWI, with no intervention performed in the time between the two studies. Two experienced readers, blinded to the results of DSA, independently reviewed the SWI sequences to assess for the presence of AVS, as determined by the presence of signal hyperintensity within a venous structure in the vicinity of the BVM being evaluated. Discrepancies in reader interpretation were resolved by consensus. Standard diagnostic accuracy parameters of SWI for the prediction of AVS in BVMs were calculated utilizing the results of DSA as the reference standard. Inter-observer agreement for the presence of AVS in the SWI sequence was calculated with the kappa statistic.

#### Results:

A total of 66 BVMs were present in the 47 patients included in our study. Twenty-four patients were female (51.1%) and 23 were male (48.9%), with a mean age of 40.7 years (range 3 months to 84 years, standard deviation 25.1 years). Median time between MRI and DSA evaluation was 13.5 days. Thirteen BVMs were associated with intracerebral hemorrhage (ICH, 19.7%) and 53 were not (80.3%). SWI demonstrated AVS in 25 of the 27 BVMs with AVS on DSA (sensitivity 92.6%, 95% CI 74-98%). There were no BVMs with AVS on SWI that did not have AVS on DSA (specificity 100%, 95% CI 89-100%). The overall diagnostic accuracy of SWI for the detection of AVS in BVMs was 97%. In the 13 BVMs associated with ICH, SWI had sensitivity and specificity of 100%. In the 53 BVMs not associated with ICH, SWI had a sensitivity of 92% and specificity of 100%. Inter-observer agreement for the diagnosis of AVS on the SWI sequence was almost perfect (kappa 0.93, 95% CI 0.91-0.96).

#### Conclusion:

SWI is highly accurate in the detection of arteriovenous shunting in vascular malformations of the brain, even in the setting of associated intracerebral hemorrhage. This novel application of SWI may be useful in both the primary diagnosis of high-flow vascular malformations of the brain and follow-up after treatment.